

Transmittal Letter to the United States
Designated/Elected Office (DO/EO/US)

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FORM PTO-1390
JC10 Rec'd PCT/PTO 21 MAR 2002

Docket No. **HM-483PCT**
U.S. Application No.
International Application No. **PCT/EP00/09157**
International Filing Date. **September 19, 2000**
Priority Date Claimed **September 24, 1999**
Title of Invention **STRIP-CASTING MACHINE WITH TWO CASTING ROLLS**
Applicant(s) for (DO/EO/US) **Heinrich Marti and Jacques Barbè**

Applicant herewith submits to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

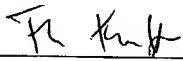
1. ☒ This is a FIRST submission of items concerning a filing under 35 U S C 371
2. ☐ This is a SECOND or SUBSEQUENT submission of items concerning a filing under 35 U S.C. 371
3. ☒ This express request to begin national examination procedures 35 U S C 371 (f) at any time rather than delay examination until the expiration of the applicable time limit set forth in 35 U S C 371(b) and PCT Articles 22 and 39(1).
4. ☐ A proper Demand for International Preliminary Examination was made by the 19th month from the earliest claimed priority date
5. ☒ A copy of the International Application as filed [35 U.S.C. 371(c)(2)],
 - a) ☒ is transmitted herewith (required only if not transmitted by the International Bureau)
 - b) ☐ has been transmitted by the international Bureau
 - c) ☐ is not required, as the application was filed in the United States Receiving Office (RO/US)
6. ☒ A translation of the International Application into English [35 U S C 371(c)(2)]
7. ☐ Amendments to the claims of the International Application under PCT Article 19 [35 U S C 371(c)(3)]
 - a) ☐ are transmitted herewith (required only if not transmitted by the International Bureau)
 - b) ☐ have been transmitted by the International Bureau
 - c) ☐ have not been made, however, the time limit for making such amendments has NOT expired
 - d) ☐ have not been made and will not be made.
8. ☐ A translation of the amendments to the claims under PCT Article 19 [35 U.S.C. 371(c)(3)]
9. ☒ An oath or declaration of the inventor(s) [35 U S C 371(c)(4)] **UNSIGNED**
10. ☒ A translation of the annexes to the International Preliminary Examination Report under PCT Article 36 [35 U.S.C. 371(c)(5)]

Items 11. to 16. below concern other document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 C F R 1.97 and 198
12. ☐ An Assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included
13. ☒ A FIRST preliminary amendment
☐ A SECOND or SUBSEQUENT preliminary amendment
14. ☐ A substitute specification
15. ☐ A change of power of attorney and/or address letter.
16. ☒ (other items or information) Three sheets of drawings, PTO-1449 w/ 7 references and International Search Report

EXPRESS MAIL No.: EV 096 601 375 US Deposited: March 21, 2002

I hereby certify that this correspondence is being deposited with the United States Postal Service Express mail under 37 CFR 1.10 on the date indicated above and is addressed to the Commissioner of Patents and Trademarks, Washington, DC 20231.


Friedrich Kueffner

March 21, 2002
Date

17. ☒ The following fees are submitted.

BASIC NATIONAL FEE [37 CFR 1.492(a)(1)-(5)]:

- ☒ Search Report has been prepared by the EPO or JPO \$ 890.00
☐ International preliminary examination fee paid to USPTO [37 CFR 1.482] \$ 710.00
☐ No International preliminary examination fee paid to USPTO [37 CFR 1.482]
but International search fee paid to USPTO [37 CFR 1.445(a)(2)]: \$ 740.00
☐ Neither International preliminary examination fee [37 CFR 1.482] nor
International search fee [37 CFR 1.445(a)(2)] paid to USPTO: \$ 1040.00
☐ International preliminary examination fee paid to USPTO [37 CFR 1.482]
and all claims satisfied provisions of PCT Article 33 (2) to (4): \$ 100.00

ENTER APPROPRIATE BASIC FEE AMOUNT: \$ 890.00

Surcharge of \$ 130.00 for furnishing the oath or declaration later than ___20___30 months
from the earliest claimed priority date [37 CFR 1.492(e)]

Claims	filed	Extra	Rate
Total Claims	26	-20=	6 x \$ 18. =
Indep. Claims	1	-3=	x \$ 84 =
Multiple Dependent Claims (if applicable) + \$ 280. =			

TOTAL OF ABOVE CALCULATIONS: \$ 998.00

Reduction by 1/2 for filing by small entity, if applicable. Verified Small Entity
Statement must be filed also [Note 37 CFR 1.9, 1.27, 1.28]

(divided by 2)

SUBTOTAL: \$ 998.00

Processing fee of \$ 130.00 for furnishing the English Translation later than ___20___30 months
from the earliest claimed priority date [37 CFR 1.492(f)]

TOTAL NATIONAL FEE: \$ 998.00

Fee for recording the enclosed assignment [37 CFR 1.21(h)] The assignment must be
accompanied by an appropriate cover sheet [37 CFR 3.28, 3.31] \$ 40.00 per property

TOTAL FEES ENCLOSED: \$ 998.00

AMOUNT TO BE REFUNDED: Refunded \$

AMOUNT TO BE CHARGED: Charged \$

- a) ☒ A check in the amount of \$ 998.00 to cover the above fees is enclosed
b) ☐ Please charge my Deposit Account No 11-1835 in the amount of \$ to cover the above fees.
A duplicate copy of this sheet is enclosed
c) ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any
overpayment to Deposit Account No 11-1835. A duplicate copy of this sheet is enclosed

NOTE: Where an appropriate time limit under 36 CFR 1.494 or 1.495 has not been met, a petition to revive [37 CFR 1.137(a) or (b)] must
be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

Friedrich Kueffner
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signature

29,482
Reg. No.

March 21, 2002
Date

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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

HM-483PCT

Applicant(s) : Heinrich Marti, et al
Serial No. : NOT YET KNOWN (PCT/EP00/09157)
Int. Filed : September 19, 2000
For : STRIP-CASTING MACHINE WITH TWO CASTING ROLLS

Assistant Commissioner for Patents
Washington, D.C. 20231

PRELIMINARY AMENDMENT

S I R:

In advance of the first office action, please amend the claims as follows:

IN THE CLAIMS

Replace current claims 1 - 26 by the enclosed amended claims 1 - 26. A marked-up version of amended claims 1 - 26 is also enclosed.

REMARKS

Claims 1 - 26 are in the application.

As a result of the foregoing amendment, the claims have been amended to remove improper multiple dependencies.

Any additional fees or charges required at this time in connection with the application may be charged to our Patent and Trademark Office Deposit Account No. 11-1835.

Respectfully submitted,

F. Kueffner

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March 21, 2002

FK:ml

ENCLS:

**Amended Claims;
Marked-Up Version.**

EXPRESS MAIL No.: **EV 096 601 375 US**

Deposited: **March 21, 2002**

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F. Kueffner

Friedrich Kueffner

CLEAN VERSION OF AMENDED CLAIMS

1. Strip-casting machine consisting of two casting rolls (2, 3, 22, 39) arranged parallel to each other, two side plates (4, 24, 42), and a standard (5, 21) for supporting the two casting rolls (2, 3, 33, 39), where the two side plate (4, 24, 42) can be set against the end surfaces of the casting rolls (2, 3, 22, 39), and where each side plate can be replaced by its own side plate changing device, wherein plate changing device is designed as a carrier element (9, 29, 43) for a side plate (4, 24, 42), and in that the carrier element (9, 29, 43) can be shifted downward together with the side plate (4, 24, 42) from a setting position and back upward again.

2. Strip-casting machine according to Claim 1, wherein the carrier element is designed as a support arm (9, 29, 43).

3. Strip-casting machine according to Claim 1, wherein the carrier element (9, 29, 43) can be shifted together with the side plate in a plane a certain distance away from the end surfaces of the casting rolls (2, 3, 22, 39).

4. Strip-casting machine according to Claim 1, wherein the carrier element (9, 29, 43) can be shifted together with the side plate in a plane essentially parallel to the end surfaces of the casting rolls.

5. Strip-casting machine according to Claim 1, wherein, in a first step, the carrier element (9, 29, 43) shifts the side plate (4, 24, 42) in a direction essentially parallel to the casting rolls (2, 3, 22, 39) and away from the end surface of the casting rolls.

6. Strip-casting machine according to Claim 5, wherein, in a second step, the carrier element (9, 29, 43) shifts the side plate (4, 24, 42) vertically (13, 20).

7. Strip-casting machine according to Claim 5, wherein, in a second step, the carrier element (9, 29, 43) shifts the side plate (4, 24, 42) around a swivel axis (11) or along a curve.

8. Strip-casting machine according to Claim 5, wherein the carrier element (9, 29, 43) shifts the side plate (4, 24, 42) in an essentially horizontal (14, 14') direction.

9. Strip-casting machine according to Claim 8, wherein the horizontal shifting (14, 14') of the side plate (4, 24, 42) takes place along a horizontal displacement path (46), which lies approximately on a plane (49) underneath the bearing points of the casting rolls (2, 3, 22, 39).

10. Strip-casting machine according to Claim 9, wherein the horizontal displacement path (46) leads the side plate (42) to a side plate changing station.

11. Strip-casting machine according to Claim 1, wherein the side plate (4, 24, 42) can be shifted downward between the bearing journals of the casting rolls (2, 3, 22, 39), which possibly have been moved a certain distance apart.

12. Strip-casting machine according to Claim 1, wherein a setting device (27) moves the side plate (24) between the setting position and the casting position by means of piston-cylinder units (30).

13. Strip-casting machine according to Claim 12, wherein the setting device (27) is mounted on the standard (21) and can be connected to and disconnected from the side plate (24) while the plate is in the setting position.

14. Strip-casting machine according to Claim 1, wherein the side plate (24, 42) remains connected to the support arm (29, 43) while the plate is in the casting position.

15. Strip-casting machine according to Claim 1, wherein the side plate (24) can be shifted downward together with the setting device (27).

16. Strip-casting machine according to Claim 15, wherein the setting device (27) is centered on the standard (21) when the side plate (24) is in the setting position, and in that the standard (21) absorbs the setting force (Figure 3) while the side plate (24) is being set.

17. Strip-casting machine according to Claim 1, wherein the side plate (24) can be shifted downward between the end surfaces of the roll barrels and the standard (21) (Figures 2, 3).

18. Strip-casting machine according to Claim 1, wherein the support arm (43) consists of a vertical and a horizontal carrier (44), and in that the horizontal carrier (44) is connected to a stroke device (45).

19. Strip-casting machine according to Claim 1, wherein the horizontal displacement path (46) is provided with a cable drag chain (48) for the supply lines of the side plates.

20. Strip-casting machine according to Claim 1, wherein the side plates (60) are provided with electromagnetic coils (61, 61') for generating an electromagnetic field to seal the gap.

21. Strip-casting machine according to Claim 1, wherein casting rolls (22) with barrels of different widths can be accommodated by the

use of intermediate pieces (32), which can be inserted between the side plate (24) and the setting device (27) (Figure 3).

22. Strip-casting machine according to Claim 1, wherein two side plate changing devices (40, 41) are provided on each side of the casting rolls (2, 3, 22, 39), where the worn-out side plate (4, 24, 42) can be carried away by the one device (arrow 14) while the new side plate can be brought up by the other (arrow 14').

23. Strip-casting machine according to Claim 1, wherein the side plates (42, 42') can be moved by the support arm (43) from the setting position in an inert gas-filled chamber (50) through a closable opening (50) and into a transfer lock chamber (52, 52') (Figures 4, 5).

24. Strip-casting machine according to Claim 23, wherein the side plate (42) can be removed from the transfer lock chamber (52, 52') as a result of relative motion between the side plate changing device (40, 41) the transfer lock chamber (52, 52') and then brought by means of a transport device (55) to and back from a side plate holding chamber (Figures 4, 5).

25. Strip-casting machine according to Claim 1, wherein the side plate (70) is provided with a heating device (71), the supply line (73) of which remains connected to the heating medium during the shift in position (Figure 7).

26. Strip-casting machine according to Claim 1, wherein the carrier element, the support arm (9), or the setting device (27) is designed to accept connectable and disconnectable feed lines for coolants, for electrical or hydraulic energy, or for other media such as inert gas or to accept measurement and control lines for the side part.

MARKED-UP VERSION OF AMENDED CLAIMS

1. Strip-casting machine consisting of two casting rolls (2, 3, 22, 39) arranged parallel to each other, two side plates (4, 24, 42), and a standard (5, 21) for supporting the two casting rolls (2, 3, 33, 39), where the two side plate (4, 24, 42) can be set against the end surfaces of the casting rolls (2, 3, 22, 39), and where each side plate can be replaced by its own side plate changing device, [characterized in that] wherein plate changing device is designed as a carrier element (9, 29, 43) for a side plate (4, 24, 42), and in that the carrier element (9, 29, 43) can be shifted downward together with the side plate (4, 24, 42) from a setting position and back upward again.

2. Strip-casting machine according to Claim 1, [characterized in that] wherein the carrier element is designed as a support arm (9, 29, 43).

3. Strip-casting machine according to [Claim 1 or Claim 2, characterized in that] Claim 1, wherein the carrier element (9, 29, 43) can be shifted together with the side plate in a plane a certain distance away from the end surfaces of the casting rolls (2, 3, 22, 39).

4. Strip-casting machine according to [Claim 1, Claim 2, or Claim 3, characterized in that] Claim 1, wherein the carrier element (9, 29, 43) can be shifted together with the side plate in a plane essentially parallel to the end surfaces of the casting rolls.

5. Strip-casting machine according to [one of Claims 1-4, characterized in that] Claim 1, wherein, in a first step, the carrier element (9, 29, 43) shifts the side plate (4, 24, 42) in a direction essentially parallel to the casting rolls (2, 3, 22, 39) and away from the end surface of the casting rolls.

6. Strip-casting machine according to Claim 5, [characterized in that] wherein, in a second step, the carrier element (9, 29, 43) shifts the side plate (4, 24, 42) vertically (13, 20).

7. Strip-casting machine according to Claim 5, [characterized in that] wherein, in a second step, the carrier element (9, 29, 43) shifts the side plate (4, 24, 42) around a swivel axis (11) or along a curve.

8. Strip-casting machine according to Claim 5, [characterized in that] wherein the carrier element (9, 29, 43) shifts the side plate (4, 24, 42) in an essentially horizontal (14, 14') direction.

9. Strip-casting machine according to Claim 8, [characterized in that] wherein the horizontal shifting (14, 14') of the side plate (4, 24, 42) takes place along a horizontal displacement path (46), which is lies approximately on a plane (49) underneath the bearing points of the casting rolls (2, 3, 22, 39).

10. Strip-casting machine according to Claim 9, [characterized in that] wherein the horizontal displacement path (46) leads the side plate (42) to a side plate changing station.

11. Strip-casting machine according to [one of Claims 1-10, characterized in that] Claim 1, wherein the side plate (4, 24, 42) can be shifted downward between the bearing journals of the casting rolls (2, 3, 22, 39), which possibly have been moved a certain distance apart.

12. Strip-casting machine according to [one of Claims 1-11, characterized in that] Claim 1, wherein a setting device (27) moves the side plate (24) between the setting position and the casting position by means of piston-cylinder units (30).

13. Strip-casting machine according to Claim 12, [characterized in that] wherein the setting device (27) is mounted on the standard (21) and can be connected to and disconnected from the side plate (24) while the plate is in the setting position.

moved by the support arm (43) from the setting position in an inert gas-filled chamber (50) through a closable opening (50) and into a transfer lock chamber (52, 52') (Figures 4, 5).

24. Strip-casting machine according to Claim 23, [characterized in that] wherein the side plate (42) can be removed from the transfer lock chamber (52, 52') as a result of relative motion between the side plate changing device (40, 41) the transfer lock chamber (52, 52') and then brought by means of a transport device (55) to and back from a side plate holding chamber (Figures 4, 5).

25. Strip-casting machine according to [one of Claims 1-24, characterized in that] Claim 1, wherein the side plate (70) is provided with a heating device (71), the supply line (73) of which remains connected to the heating medium during the shift in position (Figure 7).

26. Strip-casting machine according to [one of the preceding claims, characterized in that] Claim 1, wherein the carrier element, the support arm (9), or the setting device (27) is designed to accept connectable and disconnectable feed lines for coolants, for electrical or hydraulic energy, or for other media such as inert gas or to accept measurement and control lines for the side part.

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TRANSLATION:

WO 01/23,119 A1
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STRIP-CASTING MACHINE WITH TWO CASTING ROLLS

The invention pertains to a strip-casting machine according to the features of the introductory clause of Claim 1.

It is known that twin-roll strip-casting machines can be used to produce strips continuously from a molten metal bath, especially from molten steel. The molten metal is supplied continuously in this case to the casting gap defined by two driven casting rolls. Molten metal solidifies upstream of and in the gap, and a strip which is at least partially solidified is conveyed out of the gap by the casting rolls. This strip can then be subjected to additional continuous or discontinuous operations such as cooling, reheating, hot- or cold-rolling, shaping into sections, hardening and tempering of the surface, trimming, etc.

It is also known that, in strip-casting machines with two casting rolls set up essentially parallel to each other, the casting gap can also be limited by two side plates on the roll sides. These side plates are set elastically against the end surfaces of the barrels of the two casting rolls by setting devices. The casting rolls and usually also the two setting devices for the side plates are supported on a standard. When strips are cast, especially steel strips, the side plates are worn

down by abrasive wear as a result of the friction with the casting rolls and also, in the lower part, as a result of the friction with the solidified strip. When thus worn out, they must be replaced during a halt in the casting operations. To accomplish such replacement, the side plates are moved out of the casting position, in which the plates are resting against the barrels, in an essentially horizontal direction by the setting devices and thus away from the barrels and into a setting position. The plates are then moved upward from the setting position by means of small plate-changing devices, e.g., robots, which are mounted on the casting platform on each side of the machine (compare Japanese Patent Disclosure JP-5[1993]-329,583 A). Then the side plates are set down onto a cart and brought to the side plate renovation shop. After a renovated side plate has been preheated, it is picked up by the robot and brought into the setting position from above and attached to the machine. When such robots are provided on both sides of the machine near the standard, they block access to the strip-casting machine. When the robots are set up 2-3 m away from the standard, the size and bulk of the robots increase correspondingly, and the side plates can no longer be moved into the setting position with precision. In addition, before the side plates are set down on the standard, all the supply lines such as those for heating and cooling, electric power lines, pressure media lines, etc., must be disconnected. The installation and removal of the side plates by means of robot arms, etc., requires that the

robot arms have unhindered access to the side plates when they are in the setting position. This free access makes it difficult to enclose the casting machine so that an inert gas atmosphere can be created to keep oxygen from coming in contact with the steel strip and the cast strip.

Strip-casting machines with 2 casting rolls have been built with casting roll diameters of 50-1,500 mm. In strip-casting machines with a casting roll diameter of more than 800 mm, the sealing surfaces of the side plates, i.e., the surfaces which are in sliding contact with the end surfaces of the casting rolls, are also correspondingly larger. The setting devices, which press the side parts or the side plates against the casting rolls to form a seal, must also be designed to meet a higher set of requirements. All these requirements associated with casting rolls with diameters of more than 800 mm make it difficult to replace the side plates quickly and precisely.

The invention is based on the task of creating a strip-casting machine which overcomes the disadvantages of the state of the art and which in particular makes it easier to replace the side plates and thus reduces the retooling time between two casting operations. It should also be possible for the side plates to be positioned with greater accuracy and to be kept heated until casting begins. The side plates, furthermore, should also remain connected to all the supply and detector lines of the monitoring system for side plates of this type during the replacement

operations. An essential secondary goal is to improve the accessibility to the casting rolls, especially when the casting rolls are to be changed, and to make it simpler to prevent oxygen from reaching the casting entry and casting exit areas of the casting machine (inertization). The problems associated with rolls with diameters of more than 800 mm and correspondingly larger side plates are also to be solved.

This task is accomplished according to the invention by the sum of the features of Claim 1.

The side plate can be moved downward by the carrier element in a straight line, either vertically or at an angle or along a curve. The carrier element is advantageously designed as a support arm. The support arm can swivel around an axis or move along a curve. Underneath the machine, the side plate on the support arm can be replaced with a new side plate and moved back along the same route to the setting position. It must be kept in mind that the term "setting position" includes all positions of the plate located between the casting position and the replacement position. According to an exemplary embodiment, it is possible in a first step of the operation for the support arm to shift the side plate away from the standard essentially in a horizontal direction, i.e., in the direction of the longitudinal axis of the casting rolls. This shifting of the side plate can occur along a horizontal displacement path which can be, for example, on a plane underneath the casting rolls. In a second step of the movement, the support

arm with the side plate can then be shifted downward in a direction essentially parallel to the end surfaces of the casting rolls.

The displacement path can take the side plate to a side plate changing station, which is separated spatially from the casting platform by a wall. Separating the side plate station in this way makes it possible for the following work steps such as cleaning, maintenance, replacement, adjustment, preheating of the side plate, etc., to be carried out in an orderly and clean manner while also preventing accidents.

So that the strip-casting machine can be made narrow in proportion to the width of the strip, it is possible according to another exemplary embodiment for the side plate to be moved downward between the bearing journals or bearing points of the casting rolls. The side plate, with or without the setting device, can be shifted downward between the end surfaces of the roll barrels and the standard. For this purpose, the casting rolls can also be moved a certain distance apart.

The casting machine can be made especially narrow by mounting the setting and positioning devices on the standard and by making it possible for them to be connected to and disconnected from the side plates while the plates are in the setting position.

Regardless of whether the setting and positioning device can be lowered together with the side plate or the setting device remains on the standard during the replacement of the side plate, the side plate can be moved between the setting position and the

casting position by the use of a pressure medium and piston-cylinder units. The plate could also be moved by electromechanical means.

After the side plate has been brought into the setting or casting position, it is possible, if desired, for the support arm to be disconnected from the side part. According to an advantageous exemplary embodiment, the support arm can remain connected to the side plate even while the plate is in the casting position.

If the side plate is shifted downward together with the setting device, that is, if the setting device is also mobile, the device requires centering and support surfaces with respect to the standard when in the setting position so that the setting forces can be introduced into the standard.

The side plate changing device consists advantageously of a support arm with a vertical carrier and a horizontal carrier, where the horizontal carrier is usually connected to a stroke device.

So that the various supply media (heating and possibly cooling media, electric power, pressurized media, etc.) for the side plates can remain connected during the shifting operation as well, it is proposed that the horizontal displacement path be provided with a drag chain for the lines of the supply media to the side plates.

To improve the seal between the rotating casting rolls and the stationary side plates, the side plates can be provided with

electromagnetic coils to generate an electromagnetic field to help seal the gap.

An additional reduction in the replacement time for the side plates can be achieved by installing two side plate changing devices on each side of the casting rolls. Thus a worn-out side plate can be taken away by the one changing device while the new side plate is brought up into position by the other changing device.

The invention is explained in greater detail below on the basis of examples:

- Figure 1 shows a view of a schematic diagram of a strip-casting machine;
- Figure 2 shows a vertical section through an example of a strip-casting machine, only part of which is illustrated;
- Figure 3 shows a vertical section through another example of a strip-casting machine, only part of which is illustrated;
- Figure 4 shows a side view, in partial section, through the upper part of a strip-casting machine;
- Figure 5 shows a section along line V-V of Figure 4;
- Figure 6 shows a view of a side plate; and
- Figure 7 shows a horizontal section through another example of a side plate.

Figure 1 shows a schematic diagram of a strip-casting machine, which consists of two casting rolls 2, 3, set up essentially parallel to each other; side plates 4 on the narrow sides; and a

A carrier element 9, which is called a "support arm" in the present exemplary embodiment, is shown in dash-dot line. In principle, any type of design can be used, such as a crank drive, a system of articulated elements, a slideway, or the like. As the first step, the support arm can swing the side plate 4 downward around a swivel axis 11 along an arc (arrow 12). If desired, a horizontal component (arrow 15) can follow after the movement along an arc (arrow 12).

Arrow 13 shows how, as an alternative to an arc, the side plate 4 can be shifted vertically downward by a support arm (not shown in this figure). Arrow 14 indicates a horizontal displacement of the side plate 4 away from the standard 5 following the vertical movement. Arrows 14 and 15 show a direction which is transverse to the longitudinal axes 16, 17 of the casting rolls 2, 3. An arrow 14' indicates the incoming path along which a second side plate changing device carries a new side plate.

When the side plate 4 is being moved downward, it moves between the roll supports 6, 7 or bearing journals.

In Figure 2, reference number 22 designates a casting roll, only part of which appears, and the number 24 designates a side plate in a setting position. The side plate 24 is mounted on a

side plate changing device in the form of a support arm 29. When the side plate 24 is in the setting position, a gap 26 is present between it and a sealing surface 25 on the end of the roll 22. The gap 26 is closed by moving the side plate from the setting position into the casting position. For this gap-closing movement, a setting device 27, equipped with a centering device 28 and a stroke device 30, is provided. In the example, the setting device 27 is mounted on a standard 21, and the stroke device in the form of piston-cylinder units 30 can be connected to and disconnected from the side plate 24 in the setting position. In addition, the piston-cylinder units 30 of the setting device 27 can move the side plate 24 in a controlled manner from the setting position toward the end surface (sealing surface 25) of the casting roll 22, that is, into the casting position, and also pull it back again into the setting position.

Figure 3 shows both the side plate 24 and the setting device 27 on the support arm 29. The entire unit consisting of the side plate 24, the setting device 27, and the support arm 29 can move downward all together. In Figure 3, the side plate 24 is in the setting position. By means of the stroke devices 30, the plate can be brought into the casting position, that is, into the position in which it seals the gap between it and the casting roll 22. The unit can center itself on the standard 21, and during the gap-sealing operation the standard 21 or a support part 33 can absorb the setting forces of the stroke devices 30.

Casting rolls 22 with barrels of different widths can be accommodated by the use of intermediate pieces 32, which can be inserted between the side plate and the setting device 27. As an alternative, accommodation to strip formats of different widths can be made by designing the support arm 29 so that it can be shifted or repositioned in the axial direction of the casting rolls 22.

Figures 2 and 3 show how the side plate 24 can be shifted downward and then back upward again between the end surfaces of the roll barrels of the casting rolls 22 and the standard 21, as shown by arrow 20. In the one figure, the plate is shifted by itself, and in the other figure it is shifted along with the setting device 27.

Figures 4 and 5 show an example of a strip-casting machine with two side plate changing devices 40, 40'; 41, 41' on each side of the casting machine. The side plates are designated 42, 42'. A support arm 43 consists of a vertical carrier and a horizontal carrier 44, which are attached to each other at an angle. The horizontal carrier 44 is connected at one end to a stroke device 45, which can move the support arm 43 and the side plate 42 vertically downward from the setting position. The support arm 43 with its horizontal carrier 44 can be shifted together with the stroke device 45 along the horizontal displacement path 46 in the direction of arrow 47. So that all the media supply lines for the side plate 42 can be carried along without interference during these vertical and horizontal shifts, the displacement path 46 is

provided with a drag chain 48 for the supply lines. In Figure 4, a side plate 42" is shown on the left in dash-dot line during its horizontal displacement along the displacement path 46. The side plate 42" moves here along a plane 49 underneath the bearing journals of the casting rolls 39. As a result of this horizontal displacement, the side plate can be brought out of a sealed, air-tight inertization chamber 50, filled with an inert gas. It can then be brought through a closable opening 51 and into a transfer lock chamber 52, also filled with inert gas.

So that the side plate 42 can be replaced quickly, the side plate changing device 40' on the left side of the casting rolls 39 can conduct the worn-out side plate 42 away from the casting machine, and the side plate changing device 40 on the right side of the casting rolls can bring the new side plate into position. On the opposite side of the casting rolls, the side plate changing devices 41' and 41 can simultaneously replace the side plate 42' with the side plate 42. After the replacement process has been completed and the openings 51 of the inertization chamber 50 have been closed again, the transfer lock chambers 52, 52' can be moved away from the inertization chamber 50, as indicated by the arrow 54 on the right side, and the side plates 42 can be transferred to a transport device 55 mounted transversely to the displacement path 46 and sent to a holding chamber (not shown) for side plates. Instead of the removal of the transfer lock chamber 52, 52', it is also possible for the side plate changing device 40, 41 itself to

move horizontally out of the transfer lock chamber 52, 52', whereupon the side plate can be sent directly to a holding chamber, if desired.

Figure 6 shows a schematic diagram of a side plate 60 with electromagnetic coils 61, 61'. These coils 61, 61' generate an electromagnetic field to help seal the sealing surface between the side plate 60 in the casting position and the end surfaces of the barrels of the two casting rolls and thus to prevent the escape of casting metal.

Figure 7 shows a schematic section through a side plate 70 with an electric heating unit 71 in the interior of the side plate 70. This heating unit 71 makes it possible to heat the side plate 70 while the plate is being transported between a side plate holding chamber or a side plate preheating position and the casting position. This measure helps to reduce the idle time between two casting operations. The heating unit does not have to be installed in the side plate 70 itself, but can, for example, assume the form of an add-on device 72 (shown in dash-dot line), attached to the side plate 70.

5. Strip-casting machine according to one of Claims 1-4, characterized in that, in a first step, the carrier element (9, 29, 43) shifts the side plate (4, 24, 42) in a direction essentially parallel to the casting rolls (2, 3, 22, 39) and away from the end surface of the casting rolls.

6. Strip-casting machine according to Claim 5, characterized in that, in a second step, the carrier element (9, 29, 43) shifts the side plate (4, 24, 42) vertically (13, 20).

7. Strip-casting machine according to Claim 5, characterized in that, in a second step, the carrier element (9, 29, 43) shifts the side plate (4, 24, 42) around a swivel axis (11) or along a curve.

8. Strip-casting machine according to Claim 5, characterized in that the carrier element (9, 29, 43) shifts the side plate (4, 24, 42) in an essentially horizontal (14, 14') direction.

9. Strip-casting machine according to Claim 8, characterized in that the horizontal shifting (14, 14') of the side plate (4, 24, 42) takes place along a horizontal displacement path (46), which lies approximately on a plane (49) underneath the bearing points of the casting rolls (2, 3, 22, 39).

10. Strip-casting machine according to Claim 9, characterized in that the horizontal displacement path (46) leads the side plate (42) to a side plate changing station.

11. Strip-casting machine according to one of Claims 1-10, characterized in that the side plate (4, 24, 42) can be shifted

downward between the bearing journals of the casting rolls (2, 3, 22, 39), which possibly have been moved a certain distance apart.

12. Strip-casting machine according to one of Claims 1-11, characterized in that a setting device (27) moves the side plate (24) between the setting position and the casting position by means of piston-cylinder units (30).

13. Strip-casting machine according to Claim 12, characterized in that the setting device (27) is mounted on the standard (21) and can be connected to and disconnected from the side plate (24) while the plate is in the setting position.

14. Strip-casting machine according to one of Claims 1-13, characterized in that the side plate (24, 42) remains connected to the support arm (29, 43) while the plate is in the casting position.

15. Strip-casting machine according to one of Claims 12-14, characterized in that the side plate (24) can be shifted downward together with the setting device (27).

16. Strip-casting machine according to Claim 15, characterized in that the setting device (27) is centered on the standard (21) when the side plate (24) is in the setting position, and in that the standard (21) absorbs the setting force (Figure 3) while the side plate (24) is being set.

17. Strip-casting machine according to one of Claims 1-16, characterized in that the side plate (24) can be shifted downward

(12) NACH DEM VERTRAG ÜBER DIE INTERNATIONALE ZUSAMMENARBEIT AUF DEM GEBIET DES
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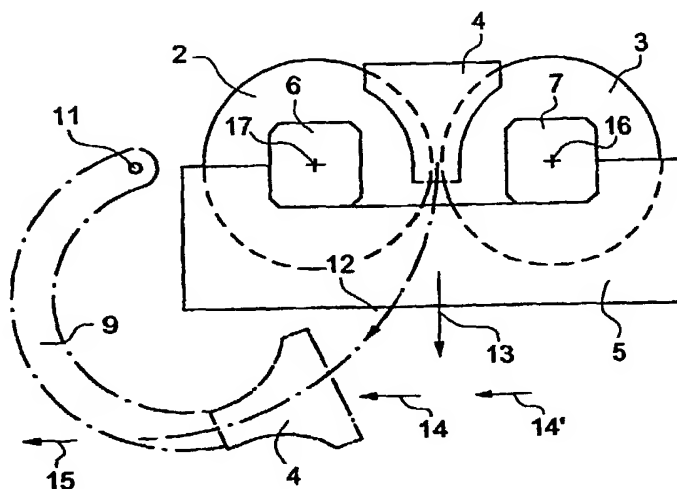
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[Fortsetzung auf der nächsten Seite]

(54) Title: STRIP-CASTING MACHINE WITH TWO CASTING ROLLS

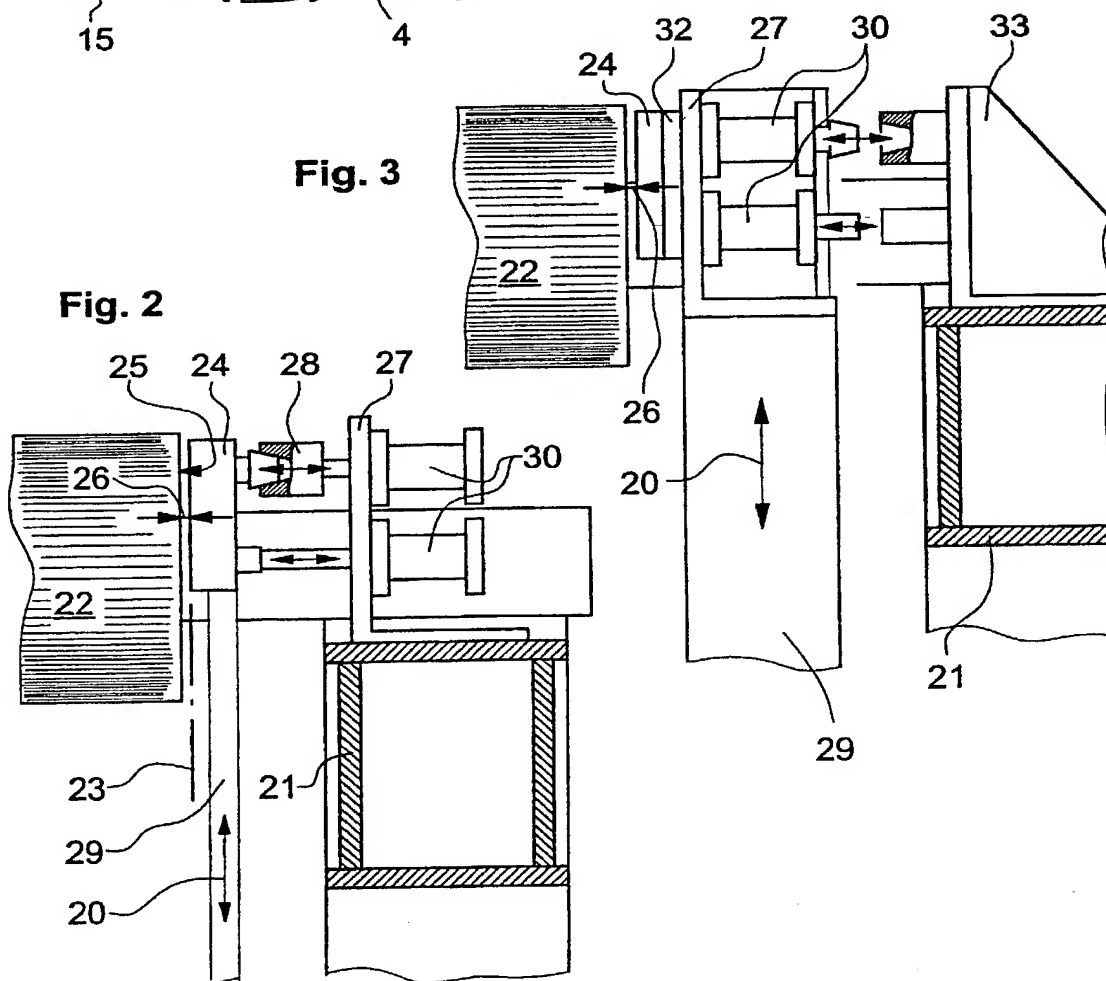
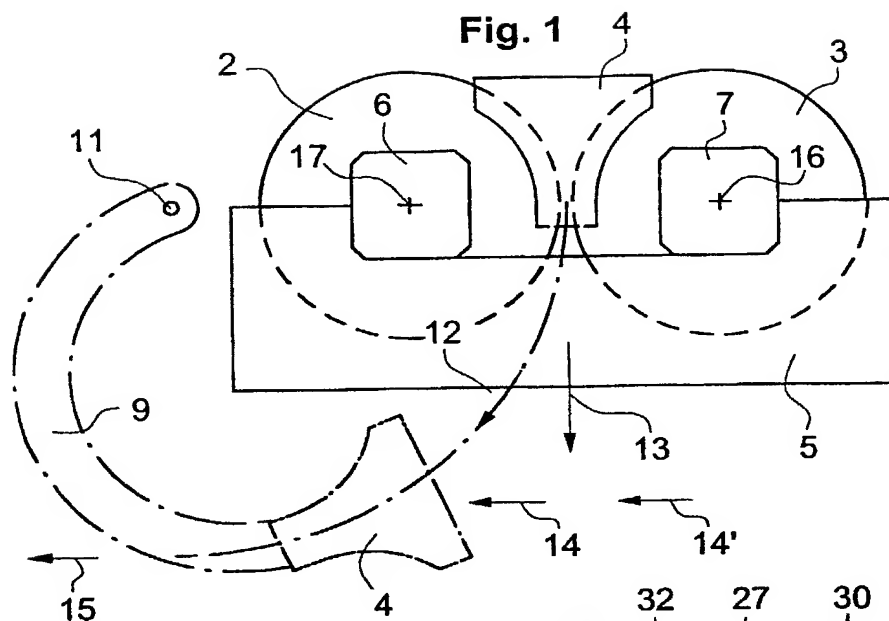
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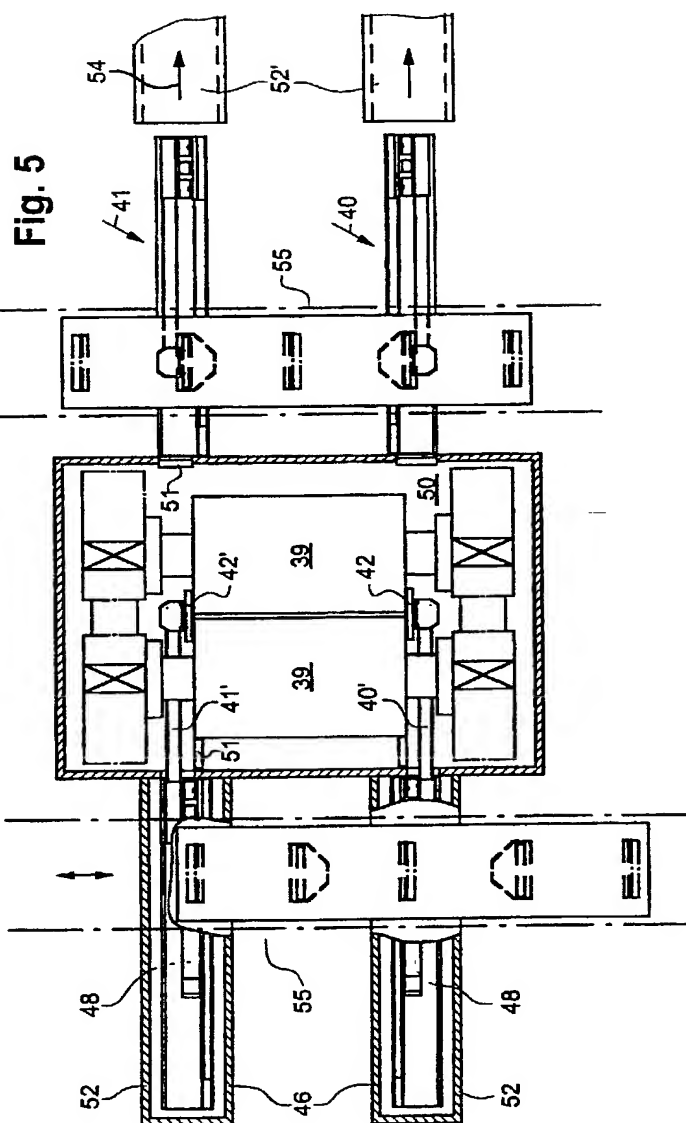
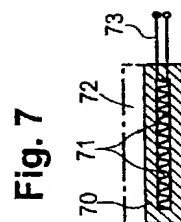
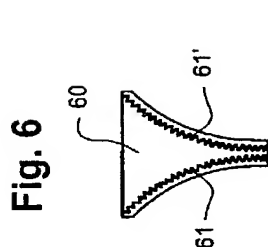
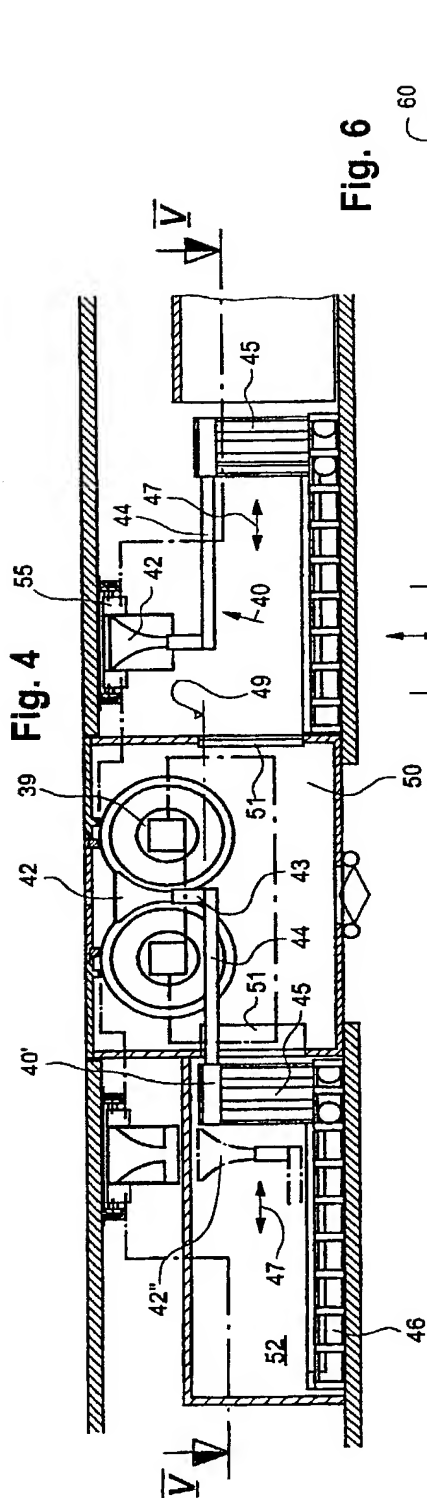


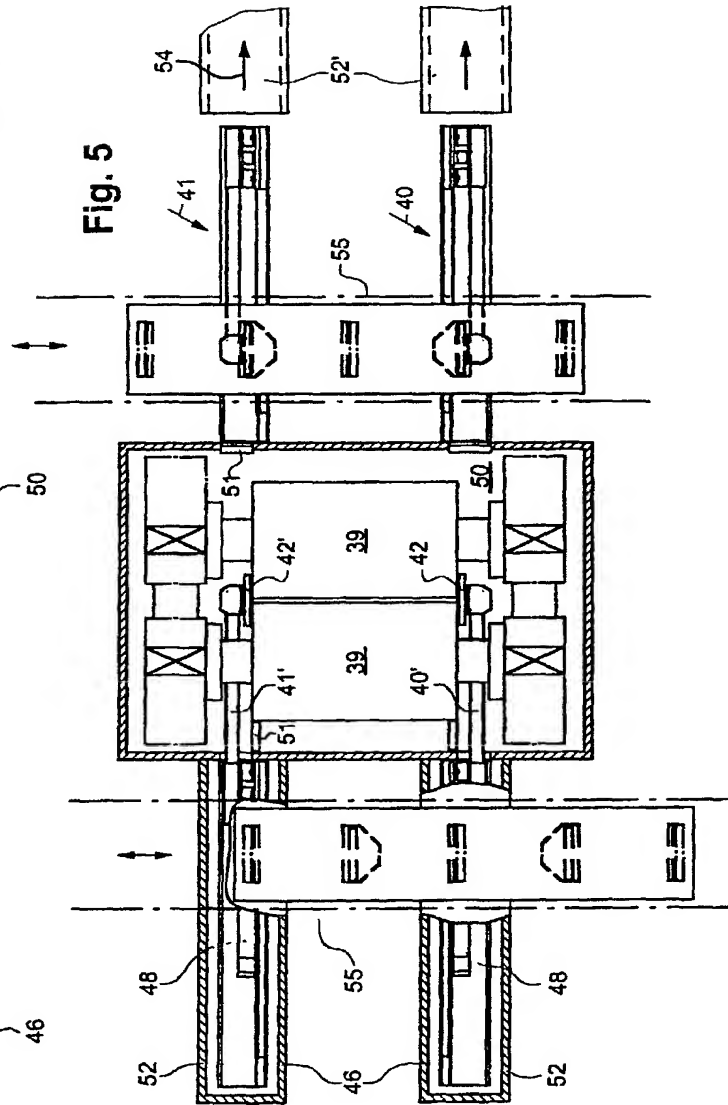
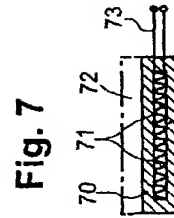
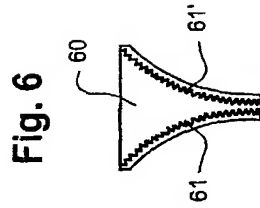
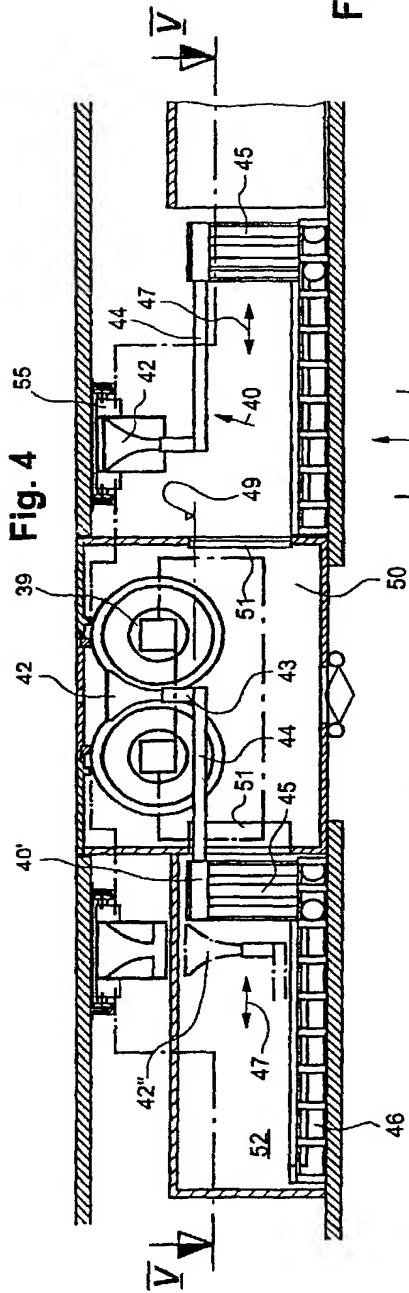
(57) Abstract: The invention relates to a strip-casting machine for producing a metal strip. Said strip-casting machine consists of a pair of casting rolls (2, 3) arranged in side-by-side parallel relation, two small faces (4) and a machine tool table (5) that supports the two casting rolls (2, 3). Said small faces (4) can be exchanged by means of a small face exchanging device. The aim of the invention is to reduce the change-over time between two castings, to improve positioning of the small faces and to heat them until start of the casting process while improving the accessibility of the casting rolls for an exchange thereof and while further allowing an optimum inerting of the plant. To this end, the small face exchanging device is configured as a support element, especially as a support arm (9) for one small face (4). Said support arm (9) and said small face (4) can be displaced in one plane from a pressing position downwards and vice versa in an essentially parallel manner and at a distance to the sealing surface of the small face (4).

[Fortsetzung auf der nächsten Seite]

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COMBINED DECLARATION FOR PARENT APPLICATION AND POWER OF ATTORNEY
(includes Reference to PCT International Applications)

Attorney's Docket No.
HM-483

As a below named inventor, I hereby declare that:
My residence, post office address and citizenship are as stated below next to my name,

I believe I am the original, first and sole inventor (if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled: **STRIP-CASTING MACHINE WITH TWO CASTING ROLLS**

the specification of which (check only one item below):

- ☐ is attached hereto.
- ☐ was filed as United States application
Serial No. _____
on _____
and was amended
on _____ (if applicable).
- ☒ was filed as PCT international application
Number **PCT/EP00/09157**
on **September 19, 2000**
and was amended under PCT Article 19
on _____ (if applicable).

I hereby state that I have reviewed and understand the contents of the above-identified specification, including the claims, as amended by any amendment referred to above.

I acknowledge the duty to disclose information which is material to the examination of this application in accordance with Title 37, Code of Federal Regulations, §1.56(a).

I hereby claim foreign priority benefits under Title 35, United States Code, §119 of any foreign application(s) for patent or inventor's certificate or of any PCT international application(s) designating at least one country other than the United States of America listed below and have also identified below any foreign application(s) for patent or inventor's certificate or any PCT international application(s) designating at least one country other than the United States of America filed by me on the same subject matter having a filing date before that of the application(s) of which priority is claimed:

PRIOR FOREIGN/PCT APPLICATION(S) AND ANY PRIORITY CLAIMS UNDER 35 U.S.C. 119:

COUNTRY (if PCT, indicate PCT)	APPLICATION NUMBER	DATE OF FILING (day, month, year)	PRIORITY CLAIMED UNDER 35 USC 119
SWITZERLAND	1999 1749/99	24 September 1999	<input checked="" type="checkbox"/> YES <input type="checkbox"/> NO
			<input type="checkbox"/> YES <input type="checkbox"/> NO

Combined Declaration For Parent Application and Power of Attorney (Continued) <i>(includes Reference to PCT International Applications)</i>	Docket No. HM-483
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I hereby claim the benefit under Title 35, United States Code, §120 of any United States application(s) or PCT international application(s) designating the United States of America that is/are listed below and, insofar as the subject matter of each of the claims of the application is not disclosed in that/those prior application(s) in the manner provided by the first paragraph of Title 35, United States Code, §112, I acknowledge the duty of disclose material information as defined in Title 37, Code of Federal Regulations, §1.56(a) which occurred between the filing date of the prior application(s) and the national or PCT international filing date of this application:

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U.S. APPLICATIONS			STATUS (CHECK ONE)		
U.S. APPLICATION NUMBER	U.S. FILING DATE		PATENTED	PENDING	ABANDONED
PCT APPLICATIONS DESIGNATING THE U.S.					
PCT APPLICATION NO.	PCT FILING DATE	U.S. SERIAL NO.			

POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact all business in the Patent and Trademark Office connected therewith. *(List name and registration number)*

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Combined Declaration For Parent Application and Power of Attorney (Continued) <i>(includes Reference to PCT International Applications)</i>				Docket No. HM-483
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	RESIDENCE & CITIZENSHIP	<u>City</u>	<u>State Or Foreign Country</u>	<u>Citizenship</u>
	POST OFFICE ADDRESS	<u>Post Office Address</u>	<u>City</u>	<u>State & Zip Code</u>
<p>I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under section 1001 of Title 18 of the United States Code, and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>				
SIGNATURE OF INVENTOR 201		SIGNATURE OF INVENTOR 202		SIGNATURE OF INVENTOR 203
				
DATE		DATE		DATE
 28. 3. 2002		 28. 03. 2002		